



# Decline of the chronic respiratory disease mortality in the WHO Western Pacific Region

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**Background:** Non-communicable diseases (NCDs) are major cause of death all over the world killing 41 million of the 57 million deaths (72%) in 2016. According to World Health Organization (WHO) Director General the biggest decrease in NCD mortality between 2000 and 2019 globally were for chronic respiratory diseases (CRDs) a 37% decline. The WHO Western Pacific Region (WPRO) made the biggest gains against CRD a 55.9% drop. We analysed CRD mortality in the WPRO comparing with other WHO regions.

**Methods:** Assessment of the risk factors was made in all WHO countries mainly in 2016. Lifestyle modifications concerning tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol in 2020. We used WHO assessment of ambient and household air pollution attributable to chronic obstructive pulmonary disease (COPD) mortality.

**Results:** WPRO comprises 27 countries, 10 high-income countries (HIC) and 17 middle-income countries (MIC). A total of 52 countries in other WHO regions belong to HIC and 86 countries to MIC. No difference was found in the tobacco demand-reduction measures. Clear difference was demonstrated in the prevalence of the raised blood pressure (RBP) which was lower in the WPRO. In the WPRO HIC every fifth has RBP while in other regions it was every fourth. Similar difference was observed for MIC. COPD mortality linked to air pollution was twice higher in the WPRO. It was highest in MIC. CRD management probably plays a crucial role in the decline of the observed mortality in the region since numerous WHO global, regional and national prevention and management CRD approaches and activities have been successfully initiated and implemented there. WHO Global Alliance against Chronic Respiratory Diseases (GARD) was successfully initiated in Beijing in 2006. Two subsequent global GARD meetings held in Seoul [2007] and Beijing [2019] had a tremendous impact on the CRD awareness, prevention and control strategies in the region. These events have stimulated development of the national CRD programmes. Beijing's declaration "Call for action for lung health" stressed the better management of CRD at primary healthcare level.

**Conclusions:** Better RBP control, improved prevention, diagnosis and treatment of CRD could contribute to the observed decline of premature CRD mortality in the region.

**Keywords:** World Health Organization (WHO); chronic respiratory diseases (CRDs); WHO Western Pacific Region (WPRO)

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## Introduction

Non-communicable diseases (NCDs) are major cause of death all over the world killing 41 million of the 57 million deaths (72%) in 2016. Cardiovascular disease (CVD) is a leading cause of death being responsible for 31% of mortality, cancers representing 16%, chronic respiratory diseases (CRDs) 7%, and diabetes 3% of all deaths. The above diseases place a heavy burden on society and health services. Fortunately, they are preventable through public policies addressing their common risk factors: smoking, unhealthy diets, excessive use of alcohol, low physical activity and air pollution (1). World Health Organization (WHO) elaborated Global NCD Action Plan 2013–2020 (2) and endorsed WHO 13th General Programme of Work 2019–2023 to control global epidemic of NCDs (3,4). Their implementation at country level will facilitate the realisation of the United Nations (UN) Sustainable Development Goal (SDG) 3.4 “by 2030, reduce by one third, premature mortality from NCDs through prevention and treatment, and promote mental health and well-being” (5). During the 79<sup>th</sup> World Health Assembly held in Geneva in May 2022, WHO Director General presented mortality from major NCDs (6) based on the annual reports of the WHO 194 countries taking into account the impact of the coronavirus disease 2019 (COVID-19) pandemic (7). Globally the biggest

decreases in deaths between 2000 and 2019 were for CRD a 37% decline in age-standardized rates for all ages combined followed by CVD (27%) and cancers (16%). Mortality from diabetes increased by 3% in the same time. The WHO Western Pacific Region (WPRO) made the biggest gains against CRD a 55.9% drop in mortality, followed by the European Region –31.4%, the African Region –30.7%, the South-East Asia Region –30.2%, the Eastern Mediterranean Region –28.9%, and the Region of the Americas –18.8% (6).

The impact of COVID-19 pandemic took place at the global scale. NCD patients, are at greater risk of exacerbations or death from COVID-19 (8-10). For instance, people with obesity or diabetics are more predisposed of being hospitalized or dying from COVID-19 (11,12). At the beginning of the pandemic, 75% of countries reported disturbance to essential NCD services caused by lockdown restrictions and redirection of resources. This included cancellation of optional care, decrease in screening and transfer of staff (7,13). During the pandemic period, exposure to some NCD risk factors changed. Governmental measures such as lockdowns led to decreasing of physical activity, and due to economic insecurity many people could not afford eating a healthy diet. Therefore, many patients for instance with coronary artery disease and chronic obstructive pulmonary disease (COPD) were also at higher risk of severe outcomes (9,10). According to WHO, excess mortality from 1 January 2020 to 31 December 2021 associated with the pandemic of COVID was about 14.9 million globally. These figures are important from the view point of the achievement of the SDG by the year 2030, however it was assumed that they did not impact on the registered decline of NCDs mortality dated 2019 (6).

In spite of the achieved progress, the pace of NCDs decline in most of WHO Member States is not enough to reach SDG target 3.4, which calls for decreasing of NCDs premature mortality by 30% comparing with a 2015 baseline and we are not on track to achieve this target by the year 2030 (6).

In view of the above we decided to analyse the CRD mortality in the WPRO which demonstrated the biggest decline of 55.9% comparing with other NCDs. According to WHO NCD Action Plan and General Programme of Work (3,4) CRD mortality could be modified by the lifestyle modifications and effective disease management. Air pollution also has a strong impact on CRD mortality (14). Since NCDs management issues in the WHO NCDs progress monitor (15) are focused mainly on CVD, heart attacks and stroke, and availability of guidelines for

### Highlight box

#### Key findings

- The biggest decline –55.9% in chronic respiratory diseases (CRDs) mortality between 2000 and 2019 was recorded in the World Health Organization (WHO) Western Pacific Region (WPRO).

#### What is known and what is new?

- Global decline of CRD mortality began since the start of this century.
- WPRO made the biggest gain against CRD, followed by the European Region –31.4%, the African Region –30.7%, the South-East Asia Region –30.2%, the Eastern Mediterranean Region –28.9%, and the Region of the Americas –18.8%. Prevalence of the raised blood pressure (RBP) was lower in the WPRO compared with other WHO regions. CRD management probably plays a crucial role in the decline of the observed mortality in the region since multiple WHO global, regional and national prevention and control programs and activities have been successfully initiated and implemented there.

#### What is the implication, and what should change now?

- Better RBP control, improved prevention, diagnosis and treatment of CRD could contribute to the observed decline of premature CRD mortality in the region.

management of NCDs is assessed jointly without separation of individual diseases we decided to compare lifestyle modification measures and air pollution attributable CRD mortality levels in countries of WPRO with other WHO regions to see what kind of intervention is associated with the observed impressive decline of CRD mortality in the WPRO. The experience obtained in the region could be used globally to reach the SDG targets on decreasing NCDs mortality by 30% by 2030. We present this article in accordance with the STROBE reporting checklist (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-22-1466/rc>).

## Methods

Official WHO statistics and publications were used for the preparation of this manuscript. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013).

### *Assessment of the risk factors*

Assessment of the risk factors was made in all WHO countries mainly in 2016. Methods of data collection and estimations are presented in NCD country profiles 2018 (1). Raised blood pressure (RBP) was assessed as the percentage of the population aged  $\geq 18$  years with the systolic blood pressure  $\geq 140$  mmHg and/or a diastolic blood pressure  $\geq 90$  mmHg. Current tobacco smoking was assessed as the percentage of the population aged  $\geq 15$  years who smoke any of the tobacco products (1,16). Alcohol consumption was defined as total alcohol per capita consumption in liters of pure alcohol per person (15 years and older over a calendar year adjusted for tourist consumption) (1,17). Insufficient physical activity was assessed as percentage of population aged 18 years+ who were physically inactive according to the WHO recommendations on physical activity and health (1,18). Obesity was defined in adults: as the percentage of the population aged years with a body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup>, and in adolescents: as the percentage of the population aged 10–19 years who are more than 2 standard deviation (SD) above the median of the WHO growth reference for children and adolescents (1,19). Ambient air pollution was defined as the exceedance of the WHO guideline level for annual mean concentration of particles with aerodynamic diameter of  $\leq 2.5$  mm in the air (by a multiple of) and household air pollution in 2016 by the percentage of the population with primary reliance on polluting fuels and technologies (1).

### *Lifestyle modification measures*

NCD attributable lifestyle modification measures concern smoking, unbalanced diet, low physical activity, and excessive use of alcohol. These risk factors have a list of interventions and thorough description to change them (15). The following activities were analyzed.

#### Smoking

Implementation by countries the following WHO Framework Convention on Tobacco Control demand-reduction measures.

- ❖ Increasing excise taxes and prices;
- ❖ Smoke-free policies;
- ❖ Implementing large graphic health warnings/plain packaging on all tobacco products;
- ❖ Enacting and enforcing advertising bans or comprehensive restrictions on tobacco promotion and sponsorship;
- ❖ Implementing effective mass media educational campaigns about the harms of smoking.

#### Excessive use of alcohol

Countries have implemented, the following measures to reduce the excessive use of alcohol according to the WHO Global Strategy to Reduce the Harmful Use of Alcohol.

- ❖ Enacting and enforcing restrictions on the physical availability of alcohol through reduction of sale hours;
- ❖ Advertising bans or comprehensive restrictions;
- ❖ Increasing excise taxes on alcohol.

#### Unbalanced diet

Countries have implemented the following measures to improve unbalanced diets.

- ❖ Adopted national policies to decrease population salt/sodium intake;
- ❖ Adopted national policies that reduce saturated fatty acids and practically eliminate industrially produced trans fatty acids.

#### Community based education and awareness campaign on physical activity

Countries have implemented at least one recent national mass media campaigns for physical activity behavioral change.

To make a quantitative analysis of the lifestyle modification achievements 2 points were given to fully achieved activities,

**Table 1** Mean population level of NCD risk factors in the WPRO and other WHO regions, 2016 year

NCD risk factors	HIC				MIC			
	WPRO (n=10)	Other regions (n=52)	t	P	WPRO (n=17)	Other regions (n=86)	t	P
Tobacco smoking aged 15 years+ (%)	20.80±7.84	23.60±7.27 (n=47)	1.04	>0.05	26.45±8.07 (n=13)	20.70±10.01 (n=61)	1.69	>0.05
Physical inactivity aged 18 years+ (%)	33.60±12.19	35.73±8.55 (n=45)	0.52	>0.05	23.06±12.22	26.88±10.20 (n=70)	1.19	>0.05
Obesity (%)	31.30±22.64	25.76±4.87 (n=50)	0.76	>0.05	25.65±18.14	17.78±8.29 (n=83)	1.75	>0.05
Harmful use of alcohol (%)	7.33±4.06 (n=9)	9.44±3.62 (n=49)	1.46	>0.05	3.88±3.20 (n=16)	5.60±3.61	1.93	>0.05
RBP aged 18 years+ (%)	20.00±3.74	25.80±6.54	3.87	<0.001	20.94±1.85	22.84±4.92	2.74	<0.01

Data are presented as mean ± SD. NCD, non-communicable disease; WPRO, WHO Western Pacific Region; WHO, World Health Organization; HIC, high-income countries; MIC, middle-income countries; RBP, raised blood pressure; SD, standard deviation.

partially achieved activities received 1 point, no response or don't know answers obtained 0 points. For example, if country succeeded in organizing at least one national/countrywide campaign on physical activity it obtained 2 points. If country organized community involvement concerning low physical activity in local actions it obtained 1 point. Full accomplishment of 5 interventions against smoking, for example, could give 10 points, against excessive use of alcohol 6 points, unhealthy diet 4, and physical activity increasing 2 points. Country could receive 22 points in case of 100% implementation of the lifestyle modification measures.

### Statistical analysis

Student's *t*-test was used to analyze continuous data expressed as mean ± SD. A two-sided *P* value <0.05 was considered as statistically significant.

### Results

WPRO comprises 27 countries. According to the World Bank classification (20), 10 countries belong to high-income countries (HIC): Australia, Brunei Darussalam, Cook Islands, Japan, Nauru, New Zealand, Niue, Palau, Republic of Korea, and Singapore. And 17 countries belong to middle-income countries (MIC): Cambodia, China, Fiji, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Federated States of Micronesia, Mongolia, Papua New Guinea, Philippines, Samoa, Solomon Islands,

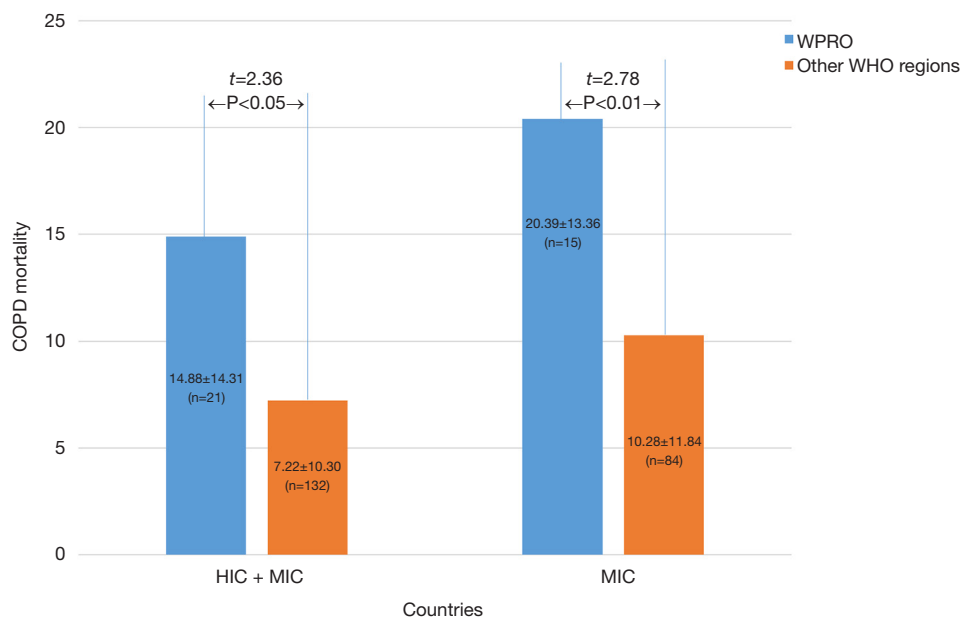
Tonga, Tuvalu, Vanuatu, Viet Nam. There are no low-income countries (LIC) in the region.

A total of 52 countries in other WHO regions belong to HIC and 86 countries to MIC.

Level of the risk factors in selected regions is presented in *Table 1*. To balance comparing groups of countries in the regions we divided them by the socio-economic status. No difference was found in the prevalence of major NCD risk factors. Clear difference was observed in the prevalence of the RBP which was significantly lower in the WPRO than in other WHO regions. In the WPRO HIC every fifth has RBP (20.00%±3.74%) while in other regions it was every fourth (25.80%±6.54%), *t*=3.87, *P*<0.001. Same difference is observed for MIC where prevalence of RBP in the WPRO was similar to HIC 20.94%±1.85% while in other WHO regions it was 22.84%±4.92%, *t*=2.74, *P*<0.01.

To see association of air pollution and CRD mortality we used WHO assessment of ambient and household air pollution attributable to COPD mortality in the WPRO and other WHO regions (21). Asthma mortality due to much lower mortality comparing with COPD is not presented in WHO risk factors and NCD attributable mortality (22,23). Clear difference is seen in this analysis. COPD mortality linked to air pollution is twice higher in the WPRO than in other WHO regions (*Figure 1*). Air quality in HIC is much better than that in MIC (1). COPD mortality attributable to air pollution (*Figure 1*) is highest in MIC of WPRO and remains twice higher than in MIC of the other WHO regions.

Lifestyle modification measures in the WPRO and other WHO regions are presented in *Table 2*. We found



**Figure 1** Ambient\* and household\*\* air pollution COPD attributable death rate (per 100,000 population, age-adjusted) in the WPRO and other WHO regions. \*, exceedance of WHO guidelines level for annual concentration of particles  $\leq 2.5 \mu\text{m}$  in the air (by a multiple of); \*\*, household air pollution was assessed by the percentage of the population with primary reliance on polluting fuel and technologies. Data are presented as mean  $\pm$  SD. WPRO, WHO Western Pacific Region; WHO, World Health Organization; COPD, chronic obstructive pulmonary disease; HIC, high-income countries; MIC, middle-income countries; SD, standard deviation.

**Table 2** Lifestyle modification measures score in the WPRO and other WHO regions, 2020 year

Lifestyle modification measures	HIC				MIC			
	WPRO (n=10)	Other regions (n=52)	t	P	WPRO (n=17)	Other regions (n=86)	t	P
All measures	9.80 $\pm$ 4.16	12.64 $\pm$ 3.62	2.02	<0.05	8.35 $\pm$ 2.57	9.57 $\pm$ 4.33	1.57	>0.05
Tobacco demand reduction measures	5.80 $\pm$ 2.10	5.62 $\pm$ 2.22	0.18	>0.05	4.70 $\pm$ 1.16	4.44 $\pm$ 2.35	0.68	>0.05
Public education and awareness campaign on physical activity	1.22 $\pm$ 0.97 (n=9)	1.81 $\pm$ 0.49	1.79	>0.05	1.06 $\pm$ 0.83	1.06 $\pm$ 0.94	-	>0.05

All measures: tobacco, harmful use of alcohol, unhealthy diet, and low physical activity. Data are presented as mean  $\pm$  SD. WPRO, WHO Western Pacific Region; WHO, World Health Organization; HIC, high-income countries; MIC, middle-income countries; SD, standard deviation.

statistically significant difference in the implementation level of all 5 lifestyle modification measures taken together in HIC. Implementation score in the WPRO was 9.80 $\pm$ 4.16 in other WHO regions it was 12.64 $\pm$ 3.62,  $t=2.02$ ,  $P<0.05$ . No difference in the implementation level was found for MIC,  $t=1.57$ ,  $P>0.05$ . Since out of 5 lifestyle modification measures only tobacco has a visible and well proven effect on CRD mortality we decided to compare implementation score of tobacco demand reduction measures in the

WPRO and other regions. We found no difference in the implementation of tobacco demand reduction measures both in HIC and MIC. Since all COPD patients benefit from regular physical activity and should repeatedly be encouraged to remain active (24) and taking into account that COPD is major CRD providing highest mortality (22,23) we compared public education and awareness campaigns on physical activity in the WPRO and other WHO regions. No difference was found (Table 2).



## Discussion

In 2019, CVD, cancers, CRD and diabetes were responsible for about 33.2 million deaths globally, increasing by 28% comparatively 2000 (25). More than 20 million of these deaths occurred in MIC, where WPRO was most heavily affected. On the other hand, WPRO made the biggest gains against CRD demonstrating 55.9% decrease of mortality. Taking into account that 4.1 million people died this year of CRD and 70% of CRD deaths could have been avoided or postponed by eliminating risk factors (26) we assumed that according to WHO NCD Action Plan (2,3) this decline could be caused by the lifestyle modification efforts, improvement of the air quality or effective management of CRD.

Lifestyle affects common modifiable risk factors, which has been recognized as a significant cause of NCDs, including CRD, around the globe (27). The relationship between the major modifiable risk factors tobacco, alcohol consumption, unhealthy dietary practice, elevated blood pressure, overweight and obesity, sedentary way of life and the main NCDs is similar in all regions of the world. However, the impact of dietary factors on the major NCD development differs. For instance, these factors play a key role in the development of CVD (27,28) but the of evidence for dietary factors in developing of CRD is less convincing than that for other major NCDs. Nevertheless, dietary recommendations for the prophylaxis of CRD are well compatible with existing dietary guidelines for the prevention of other major NCDs (29). Our analysis has demonstrated that the lifestyle modification measures mainly of unhealthy diet and harmful alcohol intake have a trend to be better implemented in other than WPRO WHO regions and therefore are not associated with the decline of CRD mortality.

RBP/arterial hypertension is a main modifiable risk factor for CVD and other NCDs (30). The burden of RBP is rising rapidly and two-thirds of RBP persons live in low- and middle-income countries (LMIC). However, nearly 50% of them are not even aware they have it, and only about one in five have it under control. It happens because of a lack of screening, diagnosis and quality care. Arterial hypertension is the most common comorbid condition in COPD (31-33) and has a strong influence on the probability of death (31). The risk of CVD complications in COPD patients is almost 2-3 times higher than in people of similar age in the general population taking into account smoking habit (34). In 40% of cases patients with mild and moderate

COPD died because of coronary heart disease, stroke or congestive heart failure, it's 8-10 times more likely than deaths-caused by respiratory insufficiency. Five years follow-up period demonstrated a higher rate of hospitalization and death of COPD patients due to CVD (34,35).

Since arterial hypertension is the most frequently occurring comorbidity in COPD optimal blood pressure control is vital for better prognosis of these patients (36). Our findings concerning low prevalence of RBP in the WPRO indicates that lower level of hypertension in the region could be linked with the observed decline of CRD mortality.

Air pollution is preventable risk factor affecting practically everybody, the ill, the elderly, children, and the poor are the most vulnerable. Urbanization, industrialization, global warming, new knowledge of the harm of air pollution raises the level of urgency for pollution control and emphasize the consequences of inaction (14). Air pollution—both indoors and outdoors—is a major risk factor for some NCDs, as it increases the risk of stroke, heart disease, lung cancer and respiratory diseases (37). In 2019, an estimated 99% of the global population was living in places where WHO's Air Quality Guidelines regarding outdoor air pollution (which set the limit for harmful levels of pollution) were not met (37,38). A total of 2.4 billion people cook and heat their homes with fuels such as coal, wood, and kerosene, which are source of indoor air pollution and represent along with second-hand tobacco smoke a serious health risk (37).

High COPD mortality attributable in our study to both ambient and household air pollution in the WPRO demonstrates that dramatic decline of CRD mortality isn't the result of the air quality improvement explaining such dynamics.

CRD management probably plays a crucial role in the decline of the observed mortality in the region.

Regretfully we could not estimate the impact of CRD management since the WHO management assessment is focused on four major NCDs taken together without separating of individual diseases. Drug therapy and counselling is given only for heart attacks and stroke (15).

Nevertheless, we can emphasize that numerous WHO global, regional and national prevention and management CRD approaches and activities have been successfully initiated and implemented in the region. Global Alliance against Chronic Respiratory Diseases (GARD) a WHO voluntary alliance of national and international organizations, agencies, and institutions (8), have been successfully launched

in Beijing in 2006 during GARD General Assembly Congress. Two subsequent global GARD meetings held in Seoul [2007] and Beijing [2019] had a tremendous impact on the CRD awareness and prevention and control strategy in the region (39). These events have stimulated development of the national CRD programmes in the region. Beijing's declaration "Call for action for lung health promotion" stressed the better management of CRD at primary healthcare level. WHO Collaborating Centre for Chronic Respiratory Diseases Prevention and Control in Dokkyo Medical University, Japan, jointly with the Ministries of Health and WHO Western Pacific Regional Office actively supported GARD development in the Guimaras Province of the Philippines (40) and Mongolia (41). GARD demonstration projects are successfully conducted in New Zealand, Vietnam, Republic of Korea (39). Success in COPD decline is closely associated with an active GARD member Global Initiative for Chronic Obstructive Lung Disease (GOLD) joint endeavor of WHO and the US based National Heart, Lung and Blood Institute. GOLD national leaders actively implement COPD prevention and control strategy in China, Australia, and Japan as members of the executive bodies of GOLD (24).

GARD demonstration project "Asthma and COPD Outpatient Care Unit (ACOCU)" in Vietnam was established in 2000 (42). It is a Nationwide initiative focused on improvement of asthma and COPD management. It organizes annual educational meetings, developing management guidelines for asthma and COPD, leading public education campaigns, and promoting healthcare policies in collaboration with other national organizations. With more than 20 education activities per year, ACOCU network has been training the respiratory function testing techniques for healthcare professionals in secondary and tertiary hospitals. GARD activities of ACOCU have been regularly reported and discussed during GARD annual meetings since its launch in 2006.

Finally, we should stress the WHO Package of Essential Noncommunicable Disease Interventions (WHO PEN) implementation in the region. PEN guidelines is focused on major NCDs, including CRD, diagnosis and management in low-resource settings (43). Since combination of COPD and RBP control could lead to decline of CRD mortality in the region it's important to demonstrate WHO PEN implementation in the Solomon Islands (44) as an example. NCDs are the leading cause of death in the Solomon Islands, responsible for 67% of deaths annually. They are a major cause of morbidity and mortality in a country where

health systems were designed to treat acute illness. In 2020, the threat of NCDs highlighted the need to strengthen the health system's capacity to treat patients with NCDs. WHO worked with the country's Ministry of Health and provincial governments to establish a package of essential treatments and policies for NCDs. This new program, Solomon Islands Package of Essential Noncommunicable Disease (SoIPEN), is based on the WHO PEN package and is a systems-based initiative that allows government health facilities to select people with NCDs and effectively treat them. For example, trained nurses can now prescribe blood pressure, and other CVD and diabetes medications, so, patients can get medications at a local clinic, instead of traveling long distances, removing a key barrier to access to medications and adherence to treatment.

The improved systems for early diagnosis and better medical treatment of NCD, focus on patient-centred holistic care, well associates with the decline of CRD mortality among Solomon Islanders and other people from low resource settings of the region. This model can be used in other regions focused on countries with limited resources. On the other hand, experience gained in other regions concerning for instance effective use of digital and mobile health approach in deprived countries could further improve lung health in the WPRO (45).

Since WHO uses CRD management assessments jointly with other NCDs (cardiovascular, cancers, and diabetes) it's not direct in our study. We can assume by exclusion that improved prevention, diagnosis and treatment of CRD could be associated with the significant decline of premature CRD mortality in the region. The role of national guidelines/standards/protocols for management of CRD through primary healthcare approach which are evidence-based, their recognition and approval by government or competent authorities is crucial for LMIC (15,46). Same concerns provision of adequate drug therapy (15,47).

## Conclusions

Lower prevalence of RBP in the WPRO indicates a better control of hypertension in this region comparatively with other WHO regions. This could be linked with the observed decline of CRD mortality since arterial hypertension is the most frequently occurring comorbidity in COPD patients. On the other hand, COPD is the most prevalent CRD and blood pressure control is vital for better prognosis of these patients. Our findings demonstrate that lifestyle modifications measures and in particular dietary

changes and diminishing of harmful alcohol intake are not associated with the decline of CRD in the region, same concerns air pollution. CRD management probably plays an important role in the decline of the observed mortality in the region since multiple WHO global, regional and national prevention and management CRD approaches and activities have been successfully initiated and implemented in the region.

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## References

1. World Health Organization. Noncommunicable diseases country profiles 2018. 2018. Accessed 18 January 2022. Available online: <https://www.who.int/publications/i/item/9789241514620>
2. World Health Organization. Global action plan for the prevention and control of NCDs 2013–2020. 2013. Accessed 16 August 2018. Available online: <https://www.who.int/publications/i/item/9789241506236>
3. World Health Organization. Thirteenth General Programme of Work 2019–2023. 2018. Accessed 16 August 2018. Available online: <https://www.who.int/about/what-we-do/thirteenth-general-programme-of-work-2019---2023>
4. World Health Organization. Thirteenth General Programme of Work, 2019–2023. 2018. Accessed 16 August 2018. Available online: [http://apps.who.int/gb/ebwha/pdf\\_files/WHA71/A71\\_R1-en.pdf](http://apps.who.int/gb/ebwha/pdf_files/WHA71/A71_R1-en.pdf)
5. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development. 2015. Accessed 16 August 2018. Available online: <https://sustainabledevelopment.un.org/post2015/transformingourworld>
6. World Health Organization. World health statistics 2022: monitoring health for the SDGs, sustainable development goals. 2022. Available online: <https://www.who.int/publications/i/item/9789240051157>
7. World Health Organization. The impact of the COVID-19 pandemic on noncommunicable disease resources and services: results of a rapid assessment. 2020. Available online: <https://www.who.int/publications/i/item/ncds-covid-rapid-assessment>
8. Khaltayev N, Akselrod S. Role of Global Alliance against Chronic Respiratory Diseases (GARD) in achievement of the UN sustainable development goals (SDG) and targets. *J Thorac Dis* 2021;13:5117–22.
9. Szarpak L, Mierzejewska M, Jurek J, et al. Effect of Coronary Artery Disease on COVID-19-Prognosis and Risk Assessment: A Systematic Review and Meta-Analysis. *Biology (Basel)* 2022;11:221.
10. Singh D, Mathioudakis AG, Higham A. Chronic obstructive pulmonary disease and COVID-19: interrelationships. *Curr Opin Pulm Med* 2022;28:76–83.
11. Sawadogo W, Tsegaye M, Gizaw A, et al. Overweight



- and obesity as risk factors for COVID-19-associated hospitalisations and death: systematic review and meta-analysis. *BMJ Nutr Prev Health* 2022;5:10-8.
12. Kastora S, Patel M, Carter B, et al. Impact of diabetes on COVID-19 mortality and hospital outcomes from a global perspective: An umbrella systematic review and meta-analysis. *Endocrinol Diabetes Metab* 2022;5:e00338.
  13. World Health Organization. CureAll framework: WHO global initiative for childhood cancer: increasing access, advancing quality, saving lives. Geneva: World Health Organization. 2021. Available online: <https://apps.who.int/iris/handle/10665/347370>
  14. Schraufnagel DE, Balmes JR, De Matteis S, et al. Health Benefits of Air Pollution Reduction. *Ann Am Thorac Soc* 2019;16:1478-87.
  15. World Health Organization. Noncommunicable Diseases Progress Monitor 2022. 2022. Available online: <https://www.who.int/publications/i/item/9789240047761>
  16. World Health Organization. WHO Framework Convention on Tobacco Control (WHO FCTC). Available online: [https://www.who.int/europe/teams/tobacco/who-framework-convention-on-tobacco-control-\(who-fctc\)](https://www.who.int/europe/teams/tobacco/who-framework-convention-on-tobacco-control-(who-fctc))
  17. World Health Organization. Global strategy to reduce the harmful use of alcohol. 2010. Available online: <https://www.who.int/publications/i/item/9789241599931>
  18. World Health Organization. Global recommendations on physical activity for health. 2010. Accessed August 16, 2018. Available online: <https://www.who.int/publications/i/item/9789241599979>
  19. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser* 2000;894:i-xii, 1-253.
  20. World Bank Data Team. New country classifications by income level: 2018-2019. Available online: <https://blogs.worldbank.org/opendata/new-country-classifications-income-level-2018-2019>
  21. World Health Organization. Air pollution data portal. 2019. Available online: <https://www.who.int/data/gho/data/themes/air-pollution/>
  22. World Health Organization. Chronic obstructive pulmonary disease (COPD). 2023. Available online: [https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-\(copd\)](https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd))
  23. World Health Organization. Asthma. 2023. Available online: <https://www.who.int/news-room/fact-sheets/detail/asthma>
  24. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease: 2022 Report. Available online: <https://goldcopd.org/2022-gold-reports/>
  25. World Health Organization. Global Health Estimates. 2019. Available online: <https://www.who.int/data/global-health-estimates>
  26. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. 2020. Accessed 12 October 2022. Available online: <https://vizhub.healthdata.org/gbd-results/>
  27. World Health Organization. Preventing chronic diseases: a vital investment: WHO global report. Geneva: World Health Organization. 2005. Available online: <https://apps.who.int/iris/handle/10665/43314>
  28. World Health Organization. Healthy diet. 2020. Available online: <https://www.who.int/news-room/fact-sheets/detail/healthy-diet>
  29. Khaltaev N. WHO dietary recommendations and prevention of chronic respiratory diseases. *J Obes Nutr Disord* 2018. doi: 10.29011/2577-2244.
  30. World Health Organization. Hypertension. 2023. Available online: <https://www.who.int/news-room/fact-sheets/detail/hypertension>
  31. Divo M, Cote C, de Torres JP, et al. Comorbidities and risk of mortality in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2012;186:155-61.
  32. Mannino DM, Thorn D, Swensen A, et al. Prevalence and outcomes of diabetes, hypertension and cardiovascular disease in COPD. *Eur Respir J* 2008;32:962-9.
  33. Aisanov Z, Khaltaev N. Management of cardiovascular comorbidities in chronic obstructive pulmonary disease patients. *J Thorac Dis* 2020;12:2791-802.
  34. Vanfleteren LEGW, Spruit MA, Wouters EFM, et al. Management of chronic obstructive pulmonary disease beyond the lungs. *Lancet Respir Med* 2016;4:911-24.
  35. Schnell K, Weiss CO, Lee T, et al. The prevalence of clinically-relevant comorbid conditions in patients with physician-diagnosed COPD: a cross-sectional study using data from NHANES 1999-2008. *BMC Pulm Med* 2012;12:26.
  36. Fabbri LM, Luppi F, Beghé B, et al. Complex chronic comorbidities of COPD. *Eur Respir J* 2008;31:204-12.
  37. World Health Organization. Ambient (outdoor) air pollution. 2022. Available online: [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)
  38. World Health Organization. What are the WHO Air quality guidelines? 2021. Available online: <https://www.who.int/news-room/feature-stories/detail/what-are-the->

- who-air-quality-guidelines
39. Global Alliance Against Chronic Respiratory Disease. Available online: <https://gard-breathefreely.org>
  40. World Health Organization. Global Alliance Against Chronic Respiratory Disease (GARD) General Meeting Report, Seoul, Republic of Korea, 1-2 June 2007. Geneva: World Health Organization. 2007. Available online: <https://apps.who.int/iris/handle/10665/43813>
  41. Sonomjamts M, Dashdemberel S, Logii N, et al. Prevalence of asthma and allergic rhinitis among adult population in Ulaanbaatar, Mongolia. *Asia Pac Allergy* 2014;4:25-31.
  42. 20-year Establishment Anniversary of Asthma—COPD Outpatient Care Unit (ACOCU) Network. Available online: [https://drive.google.com/file/d/1yT3e5HNaD2S\\_\\_jPFsCsy\\_VPP65IBOhDM/view?usp=sharing](https://drive.google.com/file/d/1yT3e5HNaD2S__jPFsCsy_VPP65IBOhDM/view?usp=sharing)
  43. World Health Organization. Package of essential noncommunicable (PEN) disease interventions for primary health care in low-resource settings. 2010. Accessed September 15, 2021. Available online: <https://www.who.int/publications-detail-redirect/9789241598996>
  44. World Health Organization. Addressing NCDs in Solomon Islands. 2021. Accessed 11 October 2022. Available online: <https://www.who.int/news-room/feature-stories/detail/addressing-ncds-in-solomon-islands>
  45. Mohammad Y, Shaaban R, Salman HA, et al. Improving the quality of hospital care provided for asthma outpatients in a country in turmoil: a report from Syria. *J Thorac Dis* 2019;11:1047-55.
  46. Hurst JR, Buist AS, Gaga M, et al. Challenges in the Implementation of Chronic Obstructive Pulmonary Disease Guidelines in Low- and Middle-Income Countries: An Official American Thoracic Society Workshop Report. *Ann Am Thorac Soc* 2021;18:1269-77.
  47. Stolbrink M, Chinouya MJ, Jayasooriya S, et al. Improving access to affordable quality-assured inhaled medicines in low- and middle-income countries. *Int J Tuberc Lung Dis* 2022;26:1023-32.

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